

We claim:

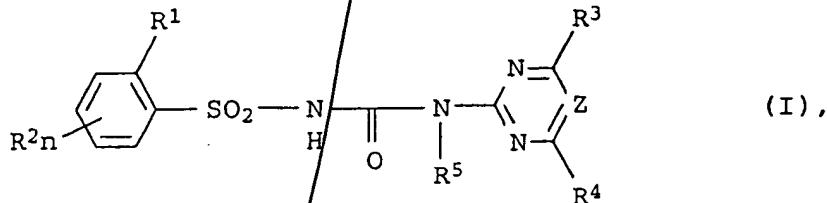
1. A herbicidal mixture comprising

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a) at least one derivative of a sulfonylurea of the formula

I

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where the substituents have the following meanings:

R¹ is C₁-C₆-alkyl which has attached to it one to five of the following groups: methoxy, ethoxy, SO₂CH₃, cyano, chlorine, fluorine, SCH₃, S(O)CH₃;

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halogen;

A

a group ER⁶ where E is O, S or NR⁷;

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COOR⁸;

NO₂;

S(O)_oR⁹, SO₂NR¹⁰R¹¹, CONR¹⁰R¹¹;

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R² is hydrogen, C₁-C₄-alkyl, C₂-C₄-alkenyl, C₂-C₄-alkynyl, halogen, C₁-C₄-alkoxy, C₁-C₄-haloalkoxy, C₁-C₄-haloalkyl, a C₁-C₂-alkylsulfonyl group, nitro, cyano or C₁-C₄-alkylthio;

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R³ is F, CF₃, CF₂Cl, CF₂H, OCF₃, OCF₂Cl, or, if R¹ is CO₂CH₃ and R² is simultaneously fluorine, R³ is Cl, or, if R¹ is CH₂CF₃ or CF₂CF₃, R³ is methyl, or, if R⁴ is OCF₃ or OCF₂Cl, R³ is OCF₂H or OCF₂Br;

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R⁴ is C₁-C₂-alkoxy, C₁-C₂-alkyl, C₁-C₂-alkylthio, C₁-C₂-alkylamino, di-C₁-C₂-alkylamino, halogen, C₁-C₂-haloalkyl, C₁-C₂-haloalkoxy,

R⁵ is hydrogen, C₁-C₂-alkoxy, C₁-C₄-alkyl;

R⁶ is C₁-C₄-alkyl, C₂-C₄-alkenyl, C₂-C₄-alkynyl or C₃-C₆-cycloalkyl, all of which can have attached to them 1 to 5 halogen atoms, with the exception of allyl, difluoromethoxy, chlorodifluoromethoxy and 2-chloroethoxy, if E is O or S. In the event that E is O or NR⁷, R⁶ is furthermore also methylsulfonyl, ethylsulfonyl, trifluoromethylsulfonyl, allyl-sulfonyl, propargylsulfonyl or dimethylsulfamoyl;

R⁷ is hydrogen, methyl or ethyl

R⁸ is a C₁-C₆-alkyl group which can have attached to it up to three of the following radicals: halogen, C₁-C₄-alkoxy, C₁-C₄-alkylthio, C₁-C₄-haloalkoxy, C₁-C₄-alkoxy-C₁-C₂-alkoxy, C₃-C₇-cycloalkyl and/or phenyl; a C₅-C₇-cycloalkyl group which can have attached to it up to three C₁-C₄-alkyl groups; C₃-C₆-alkenyl or C₃-C₆-alkynyl;

R⁹ is a C₁-C₆-alkyl group which can have attached to it one to three of the following radicals: halogen, C₁-C₄-alkoxy, C₁-C₄-alkylthio, C₁-C₄-haloalkoxy, C₁-C₄-alkoxy-C₁-C₂-alkoxy, C₃-C₇-cycloalkyl and/or phenyl; a C₅-C₇-cycloalkyl group which can have attached to it one to three C₁-C₄-alkyl groups; C₃-C₆-alkenyl or C₃-C₆-alkynyl;

R¹⁰ is hydrogen, C₁-C₂-alkoxy, C₁-C₆-alkyl, or together with R¹¹ is a C₄-C₆-alkylene chain in which one methylene group can be replaced by an oxygen atom or a C₁-C₄-alkylimino group;

R¹¹ is a C₁-C₄-alkyl group which can have attached to it one to four halogen or C₁-C₄-alkoxy radicals; C₃-C₆-cycloalkyl

n is 0 - 3

o is 1 - 2

z N or CH,

or their environmentally compatible salts

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and

b) a synergistically active amount of at least one herbicidal compound selected from groups b1 to b41

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b1 1,3,4-thiadiazoles:

buthidazole, cyprazole

10 b2 amides:

allidochlor (CDAA), benzoylprop-ethyl, bromobutide, chlorthiamid, dimepiperate, dimethenamid, diphenamid, etobenzanid (benzchlomet), flamprop-methyl, fosamin, isoxaben, monalide, naptalam, pronamid (propyzamid), propanil

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b3 aminophosphoric acids:

bilanafos, (bialaphos), buminafos, glufosinate-ammonium, glyphosate, sulfosate

20 b4 aminotriazoles:

amitrol

A

b5 anilides:

anilofos, mefenacet

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b6 aryloxyalkanoic acids:

2,4-D, 2,4-DB, clomeprop, dichlorprop, dichlorprop-P, dichlorprop-P (2,4-DP-P), fenoprop (2,4,5-TP), fluoroxypr, MCPA, MCPB, mecoprop, mecoprop-P, napropamide, napropanilide, triclopyr

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b7 benzoic acids:

chloramben, dicamba

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b8 benzothiadiazinones:

bentazone

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b9 bleaches:

clomazone (dimethazone), diflufenican, fluoro-chloridone, flupoxam, fluridone, pyrazolate, sulcotrione (chlormesulone)

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b10 carbamates

asulam, barban, butylate, carbetamid, chlorbafam, chlorpropham, cycloate, desmedipham, di-allate, EPTC, esprocarb, molinate, orbencarb, pebulate, phenisopham, phenmedipham, prophan, prosulfocarb,

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pyributicarb, sulf-allate (CDEC), terbucarb, thiobencarb (benthiocarb), tiocarbazil, tri-allate, verno-late

5 b11 quinolinecarboxylic acids:
 quinclorac, quinmerac

10 b12 chloracetanilides:
 acetochlor, alachlor, butachlor, butenachlor,
 diethatyl-ethyl, dimethachlor, metazachlor,
 metolachlor, pretilachlor, propachlor, prynachlor,
 terbuchlor, thenylchlor, xylachlor

15 b13 cyclohexenones:
 alloxydim, caloxydim, clethodim, cloproxydim,
 cycloxydim, sethoxydim, tralkoxydim, 2-[2-(4-
 chlorophenoxy)propyloxyimino]butyl]-3-hydroxy-5-(2H-
 tetrahydrothiopyran-3-yl)-2-cyclohexen-1-one

20 b14 dichlorpropionic acids:
 dalapon

25 b15 dihydrobenzofurans:
 ethofumesate

30 b16 dihydrofuran-3-ones:
 flurtamone

35 b17 dinitroanilines:
 benefin, butralin, dinitramin, ethalfluralin,
 fluchloralin, isopropalin, nitralin, oryzalin,
 pendimethalin, prodiamine, profluralin, trifluralin

40 b18 dinitrophenols:
 bromofenoxyim, dinoseb, dinoseb-acetat, dinoterb, DNOC

45 b19 diphenyl ethers:
 acifluorfen-sodium, aclonifen, bifenox, chlornitrofen
 (CNP), difenoxuron, ethoxyfen, fluorodifen, fluoro-
 glycofen-ethyl, fomesafen, furyloxyfen, lactofen,
 nitrofen, nitrofluorfen, oxyfluorfen

 b20 dipyridylenes:
 cyperquat, difenzoquat methylsulfate, diquat, para-
 quat dichloride

5 b21 ureas:
 benzthiazuron, buturon, chlorbromuron, chloroxuron,
 chlortoluron, cumyluron, dibenzyluron, cycluron,
 dimefuron, diuron, dyrrone, ethidimuron, fenuron,
 fluometuron, isoproturon, isouron, karbutilate,
 linuron, methabenzthiazuron, metobenzuron, metoxuron,
 monolinuron, monuron, neburon, siduron, tebuthiuron,
 trimeturon

10 b22 imidazoles:
 isocarbamid

15 b23 imidazolinones:
 imazamethapyr, imazapyr, imazaquin, imazethabenz-
 methyl (imazame), imazethapyr

20 b24 oxadiazoles:
 methazole, oxadiargyl, oxadiazon

25 b25 oxiranes:
 tridiphane

30 b26 phenols:
 bromoxynil, ioxynil

35 b27 phenoxyphenoxypropionic esters:
 clodinafop, cyhalofop-butyl, diclofop-methyl,
 fenoxaprop-ethyl, fenoxaprop-P-ethyl, fenthiaprop-
 ethyl, fluazifop-butyl, fluazifop-P-butyl, haloxyfop-
 ethoxyethyl, haloxyfop-methyl, haloxyfop-P-methyl,
 isoxapryifop, propaquizafop, quizalofop-ethyl,
 quizalofop-P-ethyl, quizalofop-tefuryl

40 b28 phenylacetic acids:
 chlorfenac (fenac)

45 b29 phenylpropionic acid:
 chlorophenprop-methyl

40 b30 protoporphyrinogen IX oxydase inhibitors:
 benzofenap, cinidon-ethyl, flumiclorac-pentyl,
 flumioxazin, flumipropyn, flupropacil, fluthiacet-
 methyl, pyrazoxyfen, sulfentrazone, thidiazimin

b31 pyrazoles:
nipyraclofen

b32 pyridazines:
chloridazon, maleic hydrazide, norflurazon, pyridate

b33 pyridinecarboxylic acids:
clopyralid, dithiopyr, picloram, thiazopyr

b34 pyrimidyl ethers:
pyrithiobac acid, pyrithiobac sodium, KIH-2023,
KIH-6127

b35 sulfonamides:
flumetsulam, metosulam

b36 sulfonylureas:
amidosulfuron, azimsulfuron, bensulfuron-methyl,
chlorimuron-ethyl, chlorsulfuron, cinosulfuron,
cyclosulfamuron, ethametsulfuron-methyl, ethoxy-
sulfuron, flazasulfuron, halosulfuron-methyl, imazo-
sulfuron, metsulfuron-methyl, nicosulfuron, primi-
sulfuron, prosulfuron, pyrazosulfuron-ethyl, rim-
sulfuron, sulfometuron-methyl, thifensulfuron-methyl,
triasulfuron, tribenuron-methyl, triflusulfuron-
methyl

b37 triazines:
ametryn, atrazine, aziprotryn, cyanazine, cyprazine,
desmetryn, dimethamethryne, dipropetryn, eglinazine-
ethyl, hexazinone, procyzazine, prometon, prometryn,
propazine, secbumeton, simazine, simetryn, terbume-
ton, terbutryne, terbutylazine, trietazine

b38 triazinones:
ethiozin, metamitron, metribuzin

b39 triazolecarboxamides:
triazofenamid

b40 uracils:
bromacil, lenacil, terbacil

b41 others:
benazolin, benfuresate, bensulide, benzofluor,
butamifos, cafenstrole, chlorthal-dimethyl (DCPA),

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cinmethylin, dichlobenil, endothall, fluorbentranil,
mefluidide, perfluidone, piperophos

or their environmentally compatible salts.

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2. A herbicidal mixture as claimed in claim 1, comprising a sulfonylurea of the formula I where

10 R^1 is CO_2CH_3 , $CO_2C_2H_5$, $CO_2iC_3H_7$, CF_3 , CF_2H , CH_2CF_3 , CF_2CF_3 ,
 OSO_2CH_3 , $OSO_2N(CH_3)_2$, Cl , NO_2 , $SO_2N(CH_3)_2$, SO_2CH_3 , $SO_2C_2H_5$
and $N(CH_3)SO_2CH_3$,

115 R^2 is hydrogen, halogen or methyl,

120 R^3 is CF_2H , OCF_3 , OCF_2Cl , CF_3 , or, if R^1 is CO_2CH_3 and R^2 is
simultaneously fluorine, R^3 is Cl , or, if R^1 is F_3 , CH_2CF_3
or CF_2CF_3 , R^3 is methyl,

20 R^4 is OCH_3 ,

215 R^5 is hydrogen and

220 Z is N or CH.

25 3. A herbicidal mixture as claimed in claim 1 or 2, comprising a sulfonylurea of the formula I where

26 R^1 is halogen, a group ER^6 , a group CO_2R^8 , SO_2CH_3 or $SO_2C_2H_5$,

30 R^2 is hydrogen,

31 R^3 is F,

32 R^4 is OCF_3 , OCF_2Cl , OCH_3 ,

33 R^5 is hydrogen,

34 R^6 and R^8 have the meanings given in claim 1 and

35 Z is N or CH.

40 4. A herbicidal mixture as claimed in any of claims 1 to 3, comprising a sulfonylurea of the formula I where

45 R^1 is CF_3 ,

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R² is hydrogen,

R³ is CF₃,

5 R⁴ is OCH₃,

R⁵ is hydrogen and

10 Z is N.

15 5. A herbicidal mixture as claimed in any of claims 1 to 4, comprising at least one herbicidal compound (b) from the group consisting of bromobutide, dimethenamid, isoxaben, propanil, glufosinate-ammonium, glyphosate, sulfosate, mefenacet, 2,4-D, 2,4-DB, 2,4-DBEE, dichlorprop, dichlorprop-p (2,4-DP-P), fluroxypyr, MCPA, mecoprop, mecoprop-p, dicamba, bentazone, clomazone, diflufenican, sulcotrione, phenmedipham, thiobencarb, quinchlorac, quinmerac, acetochlor, alachlor, butachlor, metazachlor, metolachlor, pretilachlor, butroxydim, clethodim, cycloxydim, sethoxydim, tralkoxydim, caloxydim, 2-{1-[2-(4-chlorophenoxy)propyloxyimino]butyl}-3-hydroxy- 5-(2H-tetrahydrothiopyran-3-yl)-2-cyclohexen-1-one, pendimethalin, acifluorfen-sodium, bifenox, fluoroglycofen-ethyl, fomesafen, lactofen, chlortoluron, cycluron, dymrone, isoproturon, methabenzthiazuron, imazaquin, imazethabenz-methyl, imazethapyr, bromoxynil, ioxynil, clodinafop, cyhalofop-butyl, fenoxyprop-ethyl, fenoxyprop-p-ethyl, 20 haloxyfop-p-methyl, cinidon-ethyl, flumiclorac-pentyl, flumipropyn, fluthiacet-methyl, pyridate, clopyralid, bispyribac-sodium, KIH-8555, KUH-920, flumetsulam, metosulam, amidosulfuron, azimsulfuron, bensulfuron-methyl, chlorimuron-ethyl, chlorsulfuron, cinosulfuron, cyclosulfamuron, 35 ethoxysulfuron, flazasulfuron, galosulfuron-methyl, HOE-107925, imazosulfuron, metsulfuron-methyl, nicosulfuron, primisulfuron, prosulfuron, pyrazosulfuron-ethyl, rimsulfuron, thifensulfuron-methyl, triasulfuron, tribenuron-methyl, atrazine, cyanazine, terbutylazin, benazolin, 40 benfuresate, cafenstrole, cinmethylin, ammonium-bentazone, cloquintocet, ET-751, F-8426, KPP-314.

45 6. A herbicidal mixture as claimed in any of claims 1 to 5, comprising at least one herbicidal compound (b) from the group consisting of

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2,4-D, MCPA, dichlorprop-p, mecoprop-p, dicamba, bentazone, diflufenican, sulcotrione, quinclorac, caloxydim, cycloxydim, sethoxydim, 2-{1-[2-(4-chlorophenoxy)propyloxyimino]butyl}-3-hydroxy-5-(2H-tetrahydrothiopyran-3-yl)-2-cyclohexen-1-one, acifluorfen-sodium, fluoroglycofen-ethyl, bromoxynil, fenoxyprop-ethyl, cinidon-ethyl, amidosulfuron, bensulfuron-methyl, metsulfuron-methyl, nicosulfuron, pyrazosulfuron-ethyl, rimsulfuron, triasulfuron, tribenuron-methyl, atrazine, terbutylazine, ammonium-bentazone, cloquintocet.

10 7. A herbicidal mixture as claimed in any of claims 1 to 6, comprising a sulfonylurea (a) of the formula I and one or more herbicidal compounds (b) in a weight ratio of 1:0.1 to 1:40.

15 8. A herbicidal mixture as claimed in claim 7, comprising a sulfonylurea (a) of the formula I and one or more herbicidal compounds (b) in a weight ratio of 1:0.2 to 1:20.

20 9. A herbicidal composition comprising a herbicidally active amount of a sulfonylurea (a) of the formula I as claimed in any of claims 1 to 4, a synergistically active amount of at least one herbicidal compound (b) as claimed in any of claims 1, 5 or 6, at least one liquid and/or solid carrier and, if desired, at least one adjuvant.

25 10. A herbicidal composition as claimed in claim 9, which comprises the sulfonylurea (a) of the formula I and one or more herbicidal compounds (b) in a weight ratio of 1:0.1 to 1:40.

30 11. A herbicidal composition as claimed in claim 9 or 10, which comprises the sulfonylurea (a) of the formula I and one or more herbicidal compounds (b) in a weight ratio of 1:0.2 to 1:20.

35 12. A method of controlling undesirable vegetation, which comprises applying a sulfonylurea (a) of the formula I as set forth in any of claims 1 to 4 and one or more herbicidal compounds (b) as set forth in claim 1 before, during and/or after the emergence of undesirable plants, either simultaneously or in succession.

40 13. A method of controlling undesirable vegetation, which comprises treating the leaves of the crop plants and of the undesirable plants with a sulfonylurea (a) of the formula I as set forth in any of claims 1 to 4 and one or more com-

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pounds (b) as set forth in claim 1, either simultaneously or in succession.

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